

## 1.2 Project Summary

The Project will be located north of the city of Jamestown and southwest of the city of Courtenay in northeastern Stutsman County, North Dakota (Figures 1, 2, 3). The planned output for the Project is up to 200.5 MW of wind energy capacity. CWF continues to assess its turbine options, but anticipates that it will utilize a turbine model with an output of between 1.5 MW and 3.0 MW. The Project Area contains approximately 24,200 acres and CWF currently leases approximately ~~19,000~~20,800 privately-owned acres for the Project.

The Project's facilities will include:

- Wind turbines and related equipment;
- New gravel access roads and improvements to existing roads;
- Underground electrical collection lines;
- Operations and maintenance (O&M) building;
- Project substation facility;
- Up to four permanent meteorological towers (up to 80 m tall);
- A temporary batch plant area and staging/laydown area for construction of the Project.

### 1.2.1 Project Area

The Project Area is composed of private land parcels subject to easement agreements between CWF and Stutsman County landowners. CWF selected the specific Project Area based on significant landowner interest, transmission and interconnection suitability, optimal wind resource, and minimal impact on environmental resources (see Section 2.3). ~~Table 1~~Table 1.2-1 lists the townships, sections, and ranges (all in Stutsman County) that are included in the Project Area.

Table 1.2-1: Project Location

Township Name	Township	Range	Sections
Gray	142 N	62 W	4, 5, 6, 7, 8, 17
Ashland	142 N	63 W	1, 2, 3, 4, 11, 12, 14
Courtenay	143 N	62 W	6, 7, 8, 17, 18, 19, 20, 21, 28, 29, 30, 21, 32, 33
Durham	143 N	63 W	1, 2, 3, 9, 10, 11, 12, 13, 14, 15, 22, 13, 24, 25, 26, 35, 36

~~July 13~~June 13

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Township Name	Township	Range	Sections
Nogosek	144 N	63 W	26, 27, 34, 35, 36

As noted in Section 1.0, the Project Area covers approximately 24,200 acres. However, the Project's above ground facilities will occupy less than one percent of that area.

### 1.2.2 Project Layout

In this application, CWF is providing a preliminary Project layout (Figure 4). This preliminary layout assumes the lowest MW turbine, which results in the largest quantity of turbines. A final Project layout will be provided to the Commission prior to the public hearing regarding this application for a Certificate.

CWF's turbine layout will optimize electrical generation and efficiency for the Project's wind resource while minimizing and avoiding environmental, cultural, and economic impacts. The Project's turbines and ancillary facilities will be sited so as to comply with the Commission's and the county's setback requirements, as well as other voluntarily-imposed setbacks. CWF will coordinate with landowners and applicable agencies regarding the Project's final design and layout.

Following the issuance of a Certificate by the Commission, CWF will hold a pre-construction meeting with the Commission staff. The pre-construction meeting offers an opportunity to review the site plan and confirm the plan's compatibility with the Certificate's requirements.

After the Project is built, CWF will file as-built surveys with the Commission, Stutsman County, and other agencies that request them.

### 1.2.3 Projected Output

The Project will have a nameplate (gross) generating capacity of up to 200.5 MW, with projected average annual output of up to 825,546 megawatt hours (MWh). This projected average annual output assumes a net capacity factor between 43 and 47 percent. The net capacity delivered to the electrical transmission system on an annual basis will be approximately 809,035 MWh. A typical capacity factor for wind energy projects in the Great Plains region is approximately 35 to 45 percent. CWF anticipates that this project will have a capacity factor that is greater than those typical of the Great Plains. CWF recognizes that actual Project output will be determined by the wind resource, final design, and equipment selection and will vary on an inter-annual basis.

## 1.3 Project Schedule

The anticipated schedule for land acquisition, Certificate receipt, construction, testing, and commercial operation is outlined below:

- Land acquisition: Completion in second quarter 2013.
- Receipt of Certificate: CWF anticipates the Certificate will be issued by September 2013.
- Construction: CWF anticipates that construction will begin in third quarter 2013 and will be completed in fourth quarter 2014.
- Testing: Testing for the Project is expected to begin in fourth quarter 2014, following the completion of construction.
- Commercial Operation Date: Commercial operation for the Project is scheduled to begin in fourth quarter 2014, following the completion of construction and testing.

Currently there are no plans for expansions or additions to the Project.

## 1.4 Project Ownership

The Project will be constructed, owned, and operated by CWF. CWF is a privately-owned independent power producer (IPP). Geronimo is its majority owner. Geronimo is a privately held renewable energy developer with headquarters in Edina, Minnesota and regional offices in Fargo and Jamestown, North Dakota. CWF's minority owner is Courtenay Wind Farmers, LLC, an independently governed North Dakota company that was formed to allow landowners to invest in the Project.

## 4.0 General Description of the Proposed Facility

### 4.1 Wind Power Technology

As wind passes over the blades of a wind turbine, it creates lift and causes the rotor to turn. The rotor is connected by a hub and main shaft to a system of gears, which are connected to a generator. Figure 7 shows a representative wind turbine with design features characteristic of the turbine types being considered for this Project.

Depending on the turbine model selected, the Project could install up to 133 turbines to meet full generation capacity (see Section 6.2). The exact turbine model has not yet been determined. The turbine model will be selected to be cost-effective, reliable, and optimize land and wind resources.

The tower is planned to be gray or white and will be between 262 feet (80 meters) and 328 feet (100 meters) tall. Typically the tower is made out of rolled steel, though recent advancements in tower fabrication have included wrapped lattice structures and partial or full cement structures. Each tower will be secured by a concrete foundation. The specific design of a foundation may vary to adapt for local soil characteristics and other geotechnical, structural, and mechanical conditions. A control panel inside the base of each turbine tower houses communication devices and electronic circuitry. Each turbine is equipped with a wind speed and direction sensor that communicates to the turbine control system, which indicates when sufficient winds are present for operation. The turbine features variable-speed control and independent blade pitch to promote aerodynamic efficiency.

The electricity generated by each turbine may be transformed within the generator or brought to a pad-mounted transformer where the voltage is raised (stepped up) to a power collection-line voltage of 34.5kV. The electricity is collected by a system of underground or overhead power collection lines within the Project Area. Power collection lines and communication cables will typically be buried underground, but may be constructed overhead as site specific considerations require. Underground collection lines are designed to be buried at a depth of ~~approximately 3-4~~ at least four feet.

All-weather, permanent gravel access roads approximately 16 to 18 feet in width will connect wind turbines to the existing county and local road network. At the intersection of the access roads and public roads, the underground communication and collection lines will continue as feeder lines, distributing power to the Project Substation. At the Project Substation, the power will again be stepped up to 115 kV and transmitted via an 115kV interconnection station to OTPCo's existing Jamestown Substation. Project interconnection to the electrical transmission system will adhere to standards detailed in the Interconnection Agreement.

Figure 8 depicts the general path of energy from the Project to energy users.



## 6.0 Engineering and Operational Design Analysis

### 6.1 Project Layout and Associated Facilities

A summary of the Project's design information is included in the Design Data Report (Appendix B). The Project will consist of up to 133 wind turbines, depending upon the final turbine type selected (see Table 6.2-1). Improvements to existing roads, construction of new gravel access roads, installation of underground electrical collection lines, construction of an O&M building, erection of up to four 80 m tall permanent meteorological towers, and construction of a step-up substation facility are also part of the Project. A temporary staging and laydown area and batch plant are planned for the construction phase of the Project. The access roads, O&M building, and associated facilities will be sited in a manner that minimizes disturbance on the site, yet provides optimal access to all turbines during operations. Drainage systems, access roads, crane pads, foundations, storage areas, and O&M facilities will be installed as necessary to fully accommodate all aspects of Project construction, operation, and maintenance. Any of these facilities not needed once construction is complete will be removed and the area around them restored to its original conditions to the extent reasonably practicable. The proposed Project plans to interconnect to the existing electrical transmission system at OTPCo's substation north of Jamestown, North Dakota. An up to 115kV generator lead line will be constructed to facilitate the Project's interconnection.

### 6.2 Description of Wind Turbines

Table 6.2-1 compares ~~three~~ four turbine types under consideration for the Project. CWF reserves the right to select alternate turbines representative of the same class of turbine. The wind turbines will operate automatically, self-starting when the wind speed reaches the designed cut-in speed specific to each turbine type under consideration for the Project. Once rated power is achieved, the wind turbine will regulate to maintain the rated power. The wind turbine will shut down once the maximum operational limit is reached and restart automatically once the wind drops below a preset restart wind speed. The standard braking system works through feathering of turbine blades. A mechanical brake that is fitted to the gearbox provides additional safety.

**Table 6.2-1. Turbine Type Characteristics for the Project**

Turbine Type	Rotor Diameter	Rotor Swept Area	Cut-in Wind Speed	Rated Power	Cut-out Wind Speed	Blade Length	Hub Height	Blade Height (Highest)	Blade Height (Lowest)	Max # of Project Turbines
Goldwind GW-77*	77 meters (252.6 feet)	4656-m <sup>2</sup> (50123 ft <sup>2</sup> )	3.5 m/s (7.3 mi/hr)	1.5 MW	22 m/s (49.2 mi/hr)	38.5 meters (126.3 feet)	85 meters (278.8 feet)	123.5 meters (405.1 feet)	46.5-meters (152.5 feet)	133
Siemens SWT-3.0-113**	113 meters (370.6 feet)	10028 m <sup>2</sup> (107948 ft <sup>2</sup> )	3 m/s (6.7 mi/hr)	3.0 MW	25 m/s (55.9 mi/hr)	56.5 meters (185.3 feet)	79.5 meters (260.7 feet)	136 meters (446.1 feet)	23.0-meters (75.4 feet)	67

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Turbine Type	Rotor Diameter	Rotor Swept Area	Cut-in Wind Speed	Rated Power	Cut-out Wind Speed	Blade Length	Hub Height	Blade Height (Highest)	Blade Height (Lowest)	Max # of Project Turbines
GE 1.6-100***	100 meters (328-feet)	7853-m2 (84593 ft2)	3 m/s (6.7 mi/hr)	1.6 MW	25 m/s (55.9 mi/hr)	49 meters (160.7 ft)	80 meters (262.4 feet)	130 meters (426.4 ft)	30-meters (98.4-feet)	124

\*From 'GW77-1500technical description.pdf', ©2012 Goldwind Science & Technology Co., Ltd

\*\*From 'SWT 3.0-113 Technical Description rev 2.pdf', ©2012 Siemens Wind Power A/S

\*\*\*From '1.6-100\_xxHz\_PCD\_allComp\_XXXXXXX.ENxx.02.pdf', ©2011 General Electric Energy

**Table 6.2-1. Turbine Type Characteristics for the Project**

Turbine Type	Rotor Diameter	Rotor Swept Area	Cut-in Wind Speed	Rated Power	Cut-out Wind Speed	Blade Length	Hub Height	Blade Height (Highest)	Blade Height (Lowest)	Max # of Project Turbines
Goldwind GW-87*	87 meters (285.4 feet)	5944 m2 (63987 ft2)	3.5 m/s (7.3 mi/hr)	1.5 MW	22 m/s (49.2 mi/hr)	43.5 meters (142.7 feet)	85 meters (278.8 feet)	129.5 meters (424.8 feet)	41.5 meters (135.5 feet)	133
Vestas V100**	100 meters (328 feet)	7853 m2 (84539 ft2)	3 m/s (6.7 mi/hr)	1.815 MW	20 m/s (44.8 mi/hr)	50 meters (164 feet)	80 meters (262.4 feet)	130 meters (426.4 feet)	30 meters (98.4 feet)	110
GE 1.6-87***	87 meters (285.4 feet)	5944 m2 (63987 ft2)	3.5 m/s (7.3 mi/hr)	1.62 MW	25 m/s (55.9 mi/hr)	43.5 meters (142.7 feet)	80 meters (262.4 feet)	123.5 meters (405.1 ft)	43.5 meters (142.7 feet)	123
Gamesa G97****	97 meters (318.2 feet)	7389 m2 (79543ft2)	3 m/s (6.7 mi/hr)	2.0 MW	25 m/s (55.9 mi/hr)	48.5 meters (159.1 feet)	78 meters (255.8 feet)	126.5 meters (414.9 feet)	29.5 meters (96.8 feet)	100

\*From 'GW87-1500technical description.pdf', ©2012 Goldwind Science & Technology Co., Ltd

\*\*From 0004-3053 General Specification.pdf, ©2011 Vestas Wind Systems A/S

\*\*\*From '01.1 1.6-87 Technical Description and Data r0.pdf, ©2012 General Electric Energy

\*\*\*\* From 'GD092760-EN R7\_G9X General characteristics description.pdf', © 2012 Gamesa Corporacion Technologica, S.A.

The wind turbine will be mounted on a tubular steel tower, a partial or fully concrete tower, or a lattice structure with an external wrap around it. All structures will be a neutral white or gray, provide internal ascent and direct access to the yaw system and nacelle and equipped with platforms and internal electric lighting. Access to the turbine is through a lockable steel door at the base of the tower. Platforms within the tower are connected with a ladder and a fall arresting safety system for access to the nacelle. A controller cabinet will be located inside each tower base. The turbine tower, on which the nacelle is mounted, consists of three to four sections manufactured from certified steel plates. All welds are made in automatically controlled power-welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion.

The rotor is a three-bladed cantilevered system mounted upwind of the tower. A yawing system will rotate the rotor around the turbine, to keep it upwind of the tower. The power output will be controlled by pitch regulation, with a variable rotor speed to maximize efficiency. The turbine uses a Supervisory Control and Data Acquisition (SCADA) system, which allows remote control

and monitoring of the status of all turbines in the Project. The monitoring system provides status views of electrical and mechanical data, operation and fault status, meteorological data, and grid station data.

Lightning protection will be consistent with the wind turbine supplier's design and specifications and local utility or code requirements. Individual components are designed with specific lightning protection systems. Some of the lightning protection systems are lightning receptors, pick-up systems, integrated conductors along key components to ground, and surge arrestors.

Turbines will be lit per Federal Aviation Administration (FAA) requirements.

## 6.3 Description of Electrical System

The electrical system design and interconnection details will be determined through studies and discussions with MISO and the potential electrical off-taker.

At the base of each turbine, a step-up transformer will be installed to raise the voltage to power collection-line voltage of 34.5kV. Power will run through an underground collection system to the Project's 34.5/115 kV step-up substation. Overhead collection lines may be required in certain areas if site conditions dictate. A new 115 kV generator lead line will exit the Project collector substation and will transmit power to OTPCo's Substation north of Jamestown, where it will interconnect with the electrical transmission system.

## 6.4 Project Construction

As an up to 200.5 MW wind energy project, CWF will benefit from economies of scale related to the Project's construction and operation. Wind energy projects have one-time costs that remain relatively stable despite the scale of the project. Therefore, a larger project will have cost advantages in comparison to a smaller project because the fixed costs are spread out over more units of output. Some examples of wind energy project costs that remain similar despite the size of the project include: an O&M Building, crane mobilization, an on-site supervisor, construction of a laydown yard, and substation procurement and construction.

The construction and restoration activities that are planned for the Project include:

- Order all necessary wind turbine components including towers, nacelles, hubs and blades;
- Complete environmental and cultural resource surveys;
- Complete preliminary survey and design to establish final locations of wind turbines, generators, access roads, collector system components, and the collector substation;
- Complete soil borings, testing, and analysis for proper foundation design and materials;
- Finalize turbine micrositeing;



- Obtain all required regulatory approvals;
- Complete final design and construction of laydown area, access roads, and crane pads;
- Complete final design and construction of wind turbine generator foundations;
- Complete final design and construction of underground electrical collector system and communication system;
- Design and construct the Project collector substation;
- Design and construct the O&M facility;
- Complete tower placement and wind turbine erection;
- Complete commissioning and testing of facility;
- Begin commercial production;
- Complete site restoration including decompaction and revegetation.

The cranes will typically travel on native soil cleared of vegetation; however, when terrain conditions require it CWF will develop temporary crane paths. The temporary paths will be up to 40 feet wide, and consist of compacted earth or aggregate, depending on soil conditions. These paths will accommodate cranes with a track width of approximately 33 feet.

The grading design and construction will also include preparation of working surfaces for assembly and erection of the wind turbine generators (see Figure 9) As discussed in Section 6.4.2, foundations for the wind turbine generators will likely be cast-in-place reinforced-concrete spread foundations. Construction will include excavation, formwork, and placement of anchor bolts, reinforcing steel, and placement and finishing of the ready-mix concrete.

The underground 34.5 kV electrical collector system and fiber optic communication system will likely be installed in a common trench. Junction boxes, where large portions of the collection system come together will be above ground; CWF will make every effort to locate these boxes in places where they will be unobtrusive to farming once construction is complete. The 34.5/115 kV collector substation will require construction of cast-in-place reinforced concrete foundations, erection of structural steel supports for electrical bus work and equipment, and installation of 34.5/115 kV transformers, circuit breakers, switches, instrument transformers, and other electrical equipment. The collector substation will be fenced and will include a prefabricated electrical equipment building with control, protection, and communications panels.

An O&M facility will be designed and constructed to accommodate personnel and equipment required for ongoing operation and maintenance. CWF will develop a well to provide potable water for the facility. Wastewater treatment facilities will be provided in accordance with all applicable state and local requirements.

### **6.4.1 Construction Management**

CWF will designate an on-site construction manager. This manager's responsibilities include scheduling and coordinating the activities of engineering, procurement and construction contractors. The construction manager will be supported by other members of CWF's team who specialize in engineering, permitting, meteorology, environmental compliance, real estate and Geographic Information Systems (GIS) mapping. CWF will also supply a landowner and



community liaison during construction to facilitate community relations and coordinate operations between the construction team, local residents and farmers, and local government.

Throughout the construction phase, ongoing coordination occurs among the Project's development, design, and construction teams. The construction manager coordinates execution of the work. This coordination includes safety and quality control programs, cost and schedule forecasting, as well as site security and ongoing communication with local officials, citizen groups, and landowners.

Following commissioning and commercial operation, the care, custody, and control of the facility transfers from the construction team to the operations staff. The construction manager works with the operations staff, the turbine supplier, and other construction and maintenance personnel to ensure a smooth transition from the start of construction to the commercial operation date of the Project. The operations staff will have full responsibility for the facility to ensure operations and maintenance are conducted in compliance with approved permits, prudent industry practice and the equipment manufacturer's recommendations.

#### **6.4.2 Foundation Design**

Each foundation design is determined through specific engineering, geotechnical sampling, and the turbine manufacturer's specifications. The tubular tower will be connected by anchor bolts to a cast-in-place reinforced-concrete foundation. The design of the turbine foundations accommodates turbine tower load specifications provided by the turbine supplier. The final dimensions and design of the foundations are dependent on soil conditions at the site. CWF currently estimates that the turbine foundations will be between 45 and 65 feet across and 7 to 15 feet thick. A majority of this foundation will be below grade with only a small pedestal for anchoring of the tower above ground. The final design parameters of the Project's foundations are ultimately decided by geotechnical surveys, turbine tower load specifications, and cost considerations. Figure 9 shows a typical wind turbine construction site.

#### **6.4.3 Civil Works**

The construction and completion of the Project will result in civil works and improvements to the land. Civil works will include the civil infrastructure, turbine foundations, and the underground electrical collection and grounding system. These civil works will include:

- Improvements, both temporary and permanent, to existing public roads required for transportation of equipment and components;
- Construction of roads adjacent to the wind turbine strings to allow construction and continued servicing of the wind turbines;
- Trenching and burying of underground 34.5 kV electrical collector cables and fiber optic cables;
- Clearing and grading for wind turbine tower foundations and installations;

- Clearing and grading for pad-mount transformers and other installations;
- Clearing and grading for Project 34.5 /115 kV collector substation and O&M building;
- Installation of on-site fencing

Improvements to existing public roads may include: increasing road width, modifying/improving subgrade, adding aggregate surfacing, improving existing culverts and bridges for over-weight loads, and installing approaches or culverts to transition to new Project access roads.

No asphalt or other paving is anticipated for the construction of the access roads. Roads used to facilitate both construction (cranes) and continued operation and maintenance will be sited in consultation with local landowners and completed in accordance with local building requirements. Siting roads in areas with unstable soil will be avoided wherever possible. All roads will include appropriate drainage and culverts while allowing for the crossing of farm equipment wherever practical. The access roads will be approximately 16 to 18 ft wide and will be covered with aggregate surfacing to provide a stable driving surface under all weather conditions. Roads will likely consist of compacted subgrade covered with geotextile and compacted aggregate surfacing. Road accesses will meet state and/or local requirements. The specific turbine placement will determine the amount of roadway that will be constructed for the Project.

Improvements to existing public roads will be performed with the consent of township and county highway department officials and the North Dakota Department of Transportation (NDDOT), if required. CWF will enter into an agreement with the local road authorities to ensure coordination. Once construction is completed, roads will be regraded, resurfaced, or otherwise restored per the terms of the applicable permits and/or agreements.

#### **6.4.4 Commissioning**

The Project will undergo detailed inspection and testing procedures prior to final turbine commissioning. Inspection and testing must occur for each component of the wind turbines, as well as the communication system, meteorological system, high voltage collection and feeder system, and the SCADA system.

## **6.5 Project Operations and Maintenance**

### **6.5.1 Maintenance Schedule**

The maintenance schedule for the wind turbines and any balance of plant equipment will be consistent with prudent industry practices and original equipment manufacturer standards. An initial maintenance inspection of each turbine will be performed after commercial operation. Following this initial inspection, each turbine will then receive annual inspections that will include inspections of the various components (wind braking system, lubricants, balance, terminal checks).

In addition to regularly scheduled site visits, the Project will be continuously monitored via the SCADA system. The SCADA system offers access to wind turbine generation or production data, availability data, meteorological and communications data, as well as alarms and communication error information. The SCADA systems will monitor Project status, allow for autonomous turbine operation, alert operations personnel, collect meteorological performance data, and provide diagnostic capabilities.

CWF and the turbine supplier will remotely monitor the Project on a daily basis. This will be accompanied by periodic visual inspections by qualified technicians. More frequent inspections will be made in the first three months of commercial operation to verify the Project is operating within expected parameters.

### **6.5.2 General Maintenance Duties**

On-site personnel will perform all O&M services for the Project including maintenance on the wind turbines, roads, buildings, and electrical infrastructure. Some common maintenance duties may include:

- Track and follow the pre-set maintenance schedule;
- Coordinate the execution of corrective maintenance;
- Maintain all parts and tools;
- Perform or cooperate with required wildlife monitoring and reporting;
- Maintain all computer software and file any required reports.

### **6.5.3 Operations and Maintenance Building**

The CWF O&M facility will be located at the Project Area, near the Project Substation. The size of a typical building used for this purpose is approximately 5,000 square feet. It will house the necessary equipment to operate and maintain the Project. The O&M building will allow maintenance staff to conduct on-site diagnostics, repairs, predictive maintenance, and preventive maintenance activities. This facility will also serve as the warehouse for critical spare parts.

## **6.6 Decommissioning and Restoration**

CWF will decommission the Project and remove the wind facilities in accordance with North Dakota Wind Turbine decommissioning guidelines (NDAC Chapter 69-09-09). This includes:

- Dismantling and removal of all towers, turbine generators, transformers, and overhead cables;
- Removal of underground cables to a depth of twenty-four inches (60.96 centimeters);
- Removal of foundations, buildings, and ancillary equipment to a depth of four feet;

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- Removal of surface road material and restoration of the roads and turbine sites to substantially the same physical condition that existed immediately before construction;
- Grading, adding topsoil, and reseedling according to Natural Resource Conservation Service (NRCS) technical guide recommendations and other agency recommendations, areas disturbed by the construction of the facility or decommissioning activities, unless the landowner requests in writing that the access roads or other land surface areas be retained.

CWF reserves the right to explore alternatives regarding Project decommissioning at the end of the Project Certificate term. Retrofitting the turbines and power system with upgrades based on new technologies may allow the Project to produce efficiently and successfully for many more years. Based on estimated costs of decommissioning and the salvage value of decommissioned equipment, the salvage value of the wind facility will exceed the cost of decommissioning. CWF will file a decommissioning plan with the Commission in accordance with NDAC Section 69-09-09-06.



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National Institutes of Health, National Cancer Institute 2010, National Institute of Environmental Health Sciences 2002).

#### ***Hazardous Materials and Waste***

A Phase I Environmental Site Assessment of the Project Area will be conducted to identify any Recognized Environmental Conditions (RECs) that may exist, including any hazardous and/or potentially hazardous sites.

Project impacts include the potential for spills, leaks, and contamination from the use of petroleum products and hydraulic fluid.

#### ***Security***

No impacts on the security and safety of local communities from construction and operation of the Project are anticipated. Wind turbine towers will be locked when O&M personnel are not utilizing the towers. The substation and the O&M Building will also be secured, locked facilities.

#### ***Air Quality***

Temporary air quality impacts caused by construction-vehicle emissions and fugitive dust from construction activities may occur, but will be minimal and temporary. No impacts to air quality from the operations of the Project are anticipated. The Project may require a temporary concrete batch plant installed on site during construction. The batch plant will be decommissioned shortly after construction is complete and will comply with all air quality regulations.

### **7.5.3 Mitigative Measures**

#### ***Electromagnetic Fields***

As outlined in Table 4.2-1, the wind turbines will be set back 1,400 feet from occupied residences. Collector lines will be buried at a depth of ~~approximately 3-4~~ at least four feet. The Project's substation will be fenced off, locked and marked with warning signs. Burial of the collection lines and appropriate setbacks for the substation will create significant attenuation of any electrical or magnetic fields so that they are similar to pre-construction levels.

#### ***Hazardous Materials and Waste***

CWF will generate minor amounts of petroleum waste during the Project's construction and operation. Any petroleum waste will be handled and disposed of in accordance with local, state, and federal regulations. Additional handling, storage, and reporting requirements for hazardous material will be covered in the Project's Spill Prevention, Control, and Containment Plan (SPCC), the NPDES permit required for the Project, and the SWPPP. CWF will implement its SPCC first as part of its SWPPP and later as part of standard operating procedures for the Project. The SPCC will provide detailed guidance for both the construction and the operations teams on the prevention of spills, as well as the control and containment of spills that the team is not capable of preventing.

#### ***Security***

mile of the Project Area) and farm buildings (uninhabited) scattered along rural county roads. These structures are focal points in the dominant open space of the vicinity.

## 7.9.2 Impacts

### Wind Turbine Appearance

All potential turbine models will be similar in appearance, with an enclosed white or gray tower, a single hub, and three blades. The primary difference between layouts will be the RD and the number of turbines. In general, larger RD turbines will have larger output and thus the Project will require fewer turbines. The ~~three~~ four representative models will have the following RD and number of turbines:

**Table 7.9-1 Rotor Diameter Turbine Height and Number of Turbines**

	<u>GE 1.6-100</u>	<u>GoldWind GW77</u>	<u>Siemens SWT 113</u>
<b>Rotor Diameter</b>	329 ft (100 m)	253 ft (77 m)	371 ft (113 m)
<b>Hub Height</b>	263 ft (80 m) or 315 ft (96 m)	279 ft (85 m) or 329 ft (100 m)	263 ft (80 m) or 312 ft (95 m)
<b>Total Height</b>	427 ft (130 m) or 493 ft (150 m)	406 ft (123.5 m) or 455 ft (138.5 m)	448 ft (136.5 m) or 498 ft (151.5 m)
<b>Number of Turbines</b>	125	133	87

	<u>Goldwind GW-87</u>	<u>Vestas V100</u>	<u>GE 1.6-87</u>	<u>Gamesa G97</u>
<b>Rotor Diameter</b>	87 meters (285.4 feet)	100 meters (328 feet)	87 meters (285.4 feet)	97 meters (318.2 feet)
<b>Hub Height</b>	85 meters (278.8 feet)	80 meters (262.4 feet)	80 meters (262.4 feet)	78 meters (255.8 feet)
<b>Total Height</b>	129.5 meters (424.8 feet)	130 meters (426.4 feet)	123.5 meters (405.1 ft)	126.5 meters (414.9 feet)
<b>Maximum Number of Turbines</b>	133	110	123	100

Though the Siemens turbine (with a 95 m tower) is about 20 percent taller than the Goldwind turbine (with an 80 m tower), using a Siemens turbine will require about 35 percent fewer turbines, so the larger turbine would be expected to have a smaller overall visual impact on the surrounding area.

Some of the Project's turbines will be located within the viewshed of lands owned or managed by the NDGFD, the NDPRD, and the USFWS as well as other natural areas and may be visible